

## Fully RoHS Compliant, Green, Thick Film, Rectangular Chip Resistors



### FEATURES

- Green resistor - does not use RoHS exemptions
- Stability  $\Delta R/R = 1\%$  for 1000 h at 70 °C
- 2 mm pitch packaging option for 0603 size
- Metal glaze on high quality ceramic
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
**GREEN**  
(5-2008)

| STANDARD ELECTRICAL SPECIFICATIONS  |                |                  |                         |  |   |                   |                            |          |
|---|----------------|------------------|-------------------------|--|---|-------------------|----------------------------|----------|
| MODEL   | CASE SIZE INCH | CASE SIZE METRIC | POWER RATING $P_{70}$ W | LIMITING ELEMENT VOLTAGE $U_{max}$ AC <sub>RMS</sub> /DC V | TEMPERATURE COEFFICIENT $\pm$ ppm/K   | TOLERANCE $\pm$ % | RESISTANCE RANGE $\Omega$  | SERIES   |
| RCG0402   | 0402           | RR 1005M         | 0.063                   | 50   | 100   | 1                 | 1R0 to 9R76<br>150R to 10M | E24; E96 |
|   |                |                  |                         |  | 150   |                   | 10R to 147R                |          |
|   |                |                  |                         |  | 200   | 5                 | 1R0 to 10M                 | E24      |
| Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 1.5\text{ A}$ |                |                  |                         |  |   |                   |                            |          |
| RCG0603   | 0603           | RR 1608M         | 0.1                     | 75   | 100   | 1                 | 1R0 to 10M                 | E24; E96 |
|   |                |                  |                         |  | 200   |                   |                            |          |
|   |                |                  |                         |  | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 2.0\text{ A}$ |                   |                            |          |
| RCG0805   | 0805           | RR 2012M         | 0.125                   | 150  | 100   | 1                 | 1R0 to 10M                 | E24; E96 |
|   |                |                  |                         |  | 200   |                   |                            |          |
|   |                |                  |                         |  | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 2.5\text{ A}$ |                   |                            |          |
| RCG1206   | 1206           | RR 3216M         | 0.25                    | 200  | 100   | 1                 | 1R0 to 10M                 | E24; E96 |
|   |                |                  |                         |  | 200   |                   |                            |          |
|   |                |                  |                         |  | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 3.5\text{ A}$ |                   |                            |          |

### Notes

- These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.
- Marking: See datasheet "Surface Mount Resistor Marking" (document number 20020).
- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material.

| TECHNICAL SPECIFICATIONS                          |          |               |         |         |         |
|---|----------|---------------|---------|---------|---------|
| PARAMETER   | UNIT     | RCG0402       | RCG0603 | RCG0805 | RCG1206 |
| Rated dissipation $P_{70}$ <sup>(1)</sup>         | W        | 0.063         | 0.1     | 0.125   | 0.25    |
| Operating voltage $U_{max}$ AC <sub>RMS</sub> /DC | V        | 50            | 75      | 150     | 200     |
| Insulation voltage $U_{ins}$ (1 min)              | V        | 75            | 100     | 200     | 300     |
| Insulation resistance                             | $\Omega$ | $> 10^9$      |         |         |         |
| Operating temperature range                       | °C       | - 55 to + 155 |         |         |         |
| Weight  | mg       | 0.65          | 2       | 5.5     | 10      |

### Note

- <sup>(1)</sup> The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature of 155 °C is not exceeded.



| PART NUMBER AND PRODUCT DESCRIPTION         |   |   |   |   |  |   |   |   |   |                                     |   |   |   |   |
|---|---|---|---|---|--|---|---|---|---|-------------------------------------|---|---|---|---|
| PART NUMBER: RCG080510K0FKEA                |   |   |   |   |  |   |   |   |   |                                     |   |   |   |   |
| R   | C | G   | 0 | 8 | 0  | 5 | 1 | 0   | K | 0                                   | F | K | E | A |
| MODEL                                       |   | VALUE   |   |   | TOLERANCE  |   |   | TCR   |   | PACKAGING                           |   |   |   |   |
| RCG0402<br>RCG0603<br>RCG0805<br>RCG1206    |   | R = Decimal<br>K = Thousand<br>M = Million<br>0000 = 0 Ω Jumper |   |   | F = ± 1.0 %<br>J = ± 5.0 %<br>Z = Jumper               |   |   | K = ± 100 ppm/K<br>L = ± 150 ppm/K<br>N = ± 200 ppm/K<br>0 = Jumper |   | EA, EB,<br>EC, ED,<br>EE, EI,<br>EL |   |   |   |   |
| PRODUCT DESCRIPTION: RCG0805 100 10K 1 % EA |   |   |   |   |  |   |   |   |   |                                     |   |   |   |   |
| RCG0805                                     |   | 100   |   |   | 10K  |   |   | 1 %   |   | EA                                  |   |   |   |   |
| MODEL                                       |   | TCR   |   |   | RESISTANCE   |   |   | TOLERANCE   |   | PACKAGING                           |   |   |   |   |
| RCG0402<br>RCG0603<br>RCG0805<br>RCG1206    |   | ± 100 ppm/K<br>± 150 ppm/K<br>± 200 ppm/K                       |   |   | 10R = 10 Ω<br>10K = 10 kΩ<br>1M = 1 MΩ<br>0R0 = Jumper |   |   | ± 1 %<br>± 5 %  |   | EA, EB,<br>EC, ED,<br>EE, EI,<br>EL |   |   |   |   |

| PACKAGING |        |            |                                       |       |       |               |
|-----------|--------|------------|---------------------------------------|-------|-------|---------------|
| MODEL     | CODE   | QUANTITY   | CARRIER TAPE                          | WIDTH | PITCH | REEL DIAMETER |
| RCG0402   | ED     | 10 000     | Paper tape acc. to IEC 60068-3 Type I | 8 mm  | 2 mm  | 180 mm/7"     |
|           | EE     | 50 000     |                                       |       |       | 330 mm/13"    |
| RCG0603   | EI     | 5000       | Paper tape acc. to IEC 60068-3 Type I | 8 mm  | 2 mm  | 180 mm/7"     |
|           | ED     | 10 000     |                                       |       |       | 180 mm/7"     |
|           | EL     | 20 000     |                                       |       |       | 285 mm/11.25" |
|           | EE     | 50 000     |                                       |       |       | 330 mm/13"    |
|           | EA     | 5000       | Paper tape acc. to IEC 60068-3 Type I | 8 mm  | 4 mm  | 180 mm/7"     |
|           | EB     | 10 000     |                                       |       |       | 285 mm/11.25" |
| EC        | 20 000 | 330 mm/13" |                                       |       |       |               |
| RCG0805   | EA     | 5000       | Paper tape acc. to IEC 60068-3 Type I | 8 mm  | 4 mm  | 180 mm/7"     |
|           | EB     | 10 000     |                                       |       |       | 285 mm/11.25" |
|           | EC     | 20 000     |                                       |       |       | 330 mm/13"    |
| RCG1206   | EA     | 5000       | Paper tape acc. to IEC 60068-3 Type I | 8 mm  | 4 mm  | 180 mm/7"     |
|           | EB     | 10 000     |                                       |       |       | 285 mm/11.25" |
|           | EC     | 20 000     |                                       |       |       | 330 mm/13"    |

| DIMENSIONS in millimeters |        |  |             |             |                                       |           |                       |     |     |                |     |     |
|---------------------------|--------|--|-------------|-------------|---------------------------------------|-----------|-----------------------|-----|-----|----------------|-----|-----|
|                           |        |  |             |             |                                       |           |                       |     |     |                |     |     |
| SIZE                      |        | DIMENSIONS                             |             |             |                                       |           | SOLDER PAD DIMENSIONS |     |     |                |     |     |
| INCH                      | METRIC | L                                      | W           | H           | T1                                    | T2        | REFLOW SOLDERING      |     |     | WAVE SOLDERING |     |     |
|                           |        |  |             |             |                                       |           | a                     | b   | l   | a              | b   | l   |
| 0402                      | 1005   | 1.0 ± 0.05                             | 0.5 ± 0.05  | 0.35 ± 0.05 | 0.25 ± 0.05                           | 0.2 ± 0.1 | 0.4                   | 0.6 | 0.5 |                |     |     |
| 0603                      | 1608   | 1.55 <sup>+0.10</sup> <sub>-0.05</sub> | 0.85 ± 0.1  | 0.45 ± 0.05 | 0.3 ± 0.2                             | 0.3 ± 0.2 | 0.5                   | 0.9 | 1.0 | 0.9            | 0.9 | 1.0 |
| 0805                      | 2012   | 2.0 <sup>+0.20</sup> <sub>-0.10</sub>  | 1.25 ± 0.15 | 0.45 ± 0.05 | 0.3 <sup>+0.20</sup> <sub>-0.10</sub> | 0.3 ± 0.2 | 0.7                   | 1.3 | 1.2 | 0.9            | 1.3 | 1.3 |
| 1206                      | 3216   | 3.2 <sup>+0.10</sup> <sub>-0.20</sub>  | 1.6 ± 0.15  | 0.55 ± 0.05 | 0.45 ± 0.2                            | 0.4 ± 0.2 | 0.9                   | 1.7 | 2.0 | 1.1            | 1.7 | 2.3 |

**FUNCTIONAL PERFORMANCE**


| GREEN REQUIREMENTS                   |                     |
|--------------------------------------|---------------------|
| SUBSTANCES                           | CONCENTRATION LIMIT |
| Lead (Pb)                            | < 1000 ppm          |
| Mercury (Hg)                         | < 1000 ppm          |
| Cadmium (Cd)                         | < 100 ppm           |
| Hexavalent Chromium                  | < 1000 ppm          |
| Polybrominated Biphenyl (PBB)        | < 1000 ppm          |
| Polybrominated Diphenyl Ether (PBDE) | < 1000 ppm          |
| Bromine (Br)                         | < 900 ppm           |
| Chlorine (Cl)                        | < 900 ppm           |
| Sum of Bromine and Chlorine          | ≤ 1500 ppm max.     |
| Antimony (Sb)                        | < 900 ppm           |
| Red Phosphorous                      | < 100 ppm           |

**Notes**

- No exemptions (e.g. Pb in glass) may be applied to any substances or application for the “Green” category
- All concentration levels are based on homogenous materials



| TEST PROCEDURES AND REQUIREMENTS |                         |  |   |  |                                |
|----------------------------------|-------------------------|--|---|--|--------------------------------|
| EN 60115-1 CLAUSE                | IEC 60068-2 TEST METHOD | TEST                                       | PROCEDURE   | REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )   |                                |
|                                  |                         |  | Stability for product types:  | <b>STABILITY CLASS 2 OR BETTER</b>   |                                |
|                                  |                         |  | <b>RCG e3</b>   | 1 $\Omega$ to 10 M $\Omega$  | 1 $\Omega$ to 10 M $\Omega$    |
| 4.5                              | -                       | Resistance                                 | -   | $\pm 1 \%$   | $\pm 5 \%$                     |
| 4.7                              | -                       | Voltage proof                              | $U = 1.4 \times U_{ins}$ ; 60 s   | No flashover or breakdown  |                                |
| 4.13                             | -                       | Short time overload                        | $U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$ ;<br>Duration acc. to style                    | $\pm (0.25 \% R + 0.05 \Omega)$  | $\pm (0.5 \% R + 0.05 \Omega)$ |
| 4.17.2                           | 58 (Td)                 | Solderability                              | Solder bath method;<br>Sn96.5Ag3Cu0.5<br>non-activated flux;<br>(245 $\pm$ 5) $^{\circ}$ C<br>(3 $\pm$ 0.3) s | Good tinning ( $\geq 95 \%$ covered)<br>no visible damage                              |                                |
| 4.8.4.2                          | -                       | Temperature coefficient                    | (20/- 55/20) $^{\circ}$ C and<br>(20/125/20) $^{\circ}$ C   | $\pm 100$ ppm/K, $\pm 150$ ppm/K   | $\pm 200$ ppm/K                |
| 4.32                             | 21 ( $U_{u3}$ )         | Shear (adhesion)                           | RR 1608 and smaller: 9 N<br>RR 2012 and larger: 45 N  | No visible damage  |                                |
| 4.33                             | 21 ( $U_{u1}$ )         | Substrate bending                          | Depth 2 mm;<br>3 times  | No visible damage, no open circuit in bent position<br>$\pm (0.25 \% R + 0.05 \Omega)$ |                                |
| 4.23                             | -                       | Climatic sequence:                         | -   |  |                                |
| 4.23.2                           | 2 (Ba)                  | Dry heat                                   | 125 $^{\circ}$ C; 16 h  |  |                                |
| 4.23.3                           | 30 (Db)                 | Damp heat, cyclic                          | 55 $^{\circ}$ C; $\geq 90 \%$ RH;<br>24 h; 1 cycle  |  |                                |
| 4.23.4                           | 1 (Aa)                  | Cold                                       | - 55 $^{\circ}$ C; 2 h  | $\pm (1 \% R + 0.05 \Omega)$   | $\pm (2 \% R + 0.1 \Omega)$    |
| 4.23.5                           | 13 (M)                  | Low air pressure                           | 1 kPa; (25 $\pm$ 10) $^{\circ}$ C; 1 h  |  |                                |
| 4.23.6                           | 30 (Db)                 | Damp heat, cyclic                          | 55 $^{\circ}$ C; $\geq 90 \%$ RH;<br>24 h; 5 cycles   |  |                                |
| 4.23.7                           | -                       | DC load                                    | $U = \sqrt{P_{70} \times R}$  |  |                                |
| 4.25.1                           | -                       | Endurance at 70 $^{\circ}$ C               | $U = \sqrt{P_{70} \times R} \leq U_{max.}$ ;<br>1.5 h on; 0.5 h off;<br>70 $^{\circ}$ C; 1000 h               | $\pm (1 \% R + 0.05 \Omega)$   | $\pm (2 \% R + 0.1 \Omega)$    |
| 4.18.2                           | 58 (Td)                 | Resistance to soldering heat               | Solder bath method<br>(260 $\pm$ 5) $^{\circ}$ C;<br>(10 $\pm$ 1) s   | $\pm (0.25 \% R + 0.05 \Omega)$  | $\pm (0.5 \% R + 0.05 \Omega)$ |
| 4.35                             | -                       | Flamability, needle flame test             | IEC 60695-11-5;<br>10 s   | No burning after 30 s  |                                |
| 4.24                             | 78 (Cab)                | Damp heat, steady state                    | (40 $\pm$ 2) $^{\circ}$ C;<br>(93 $\pm$ 3) % RH;<br>56 days   | $\pm (1 \% R + 0.05 \Omega)$   |                                |
| 4.25.3                           | -                       | Endurance at upper category temperature    | 155 $^{\circ}$ C, 1000 h  | $\pm (1 \% R + 0.05 \Omega)$   | $\pm (2 \% R + 0.1 \Omega)$    |
| 4.40                             | -                       | Electrostatic discharge (human body model) | IEC 61340-3-1;<br>3 pos. + 3 neg. discharges;<br>ESD test voltage acc. to size                                | $\pm (1 \% R + 0.05 \Omega)$   |                                |



| TEST PROCEDURES AND REQUIREMENTS |                                  |   |   |   |                                  |
|----------------------------------|----------------------------------|---|---|---|----------------------------------|
| EN 60115-1<br>CLAUSE             | IEC<br>60068-2<br>TEST<br>METHOD | TEST  | PROCEDURE   | REQUIREMENTS<br>PERMISSIBLE CHANGE ( $\Delta R$ ) |                                  |
|                                  |                                  |   | Stability for product types:  | <b>STABILITY CLASS 2 OR BETTER</b>                |                                  |
|                                  |                                  |   | <b>RCG e3</b>   | 1 $\Omega$ to 10 M $\Omega$                       | 1 $\Omega$ to 10 M $\Omega$      |
| 4.29                             | 45 (XA)                          | Component solvent resistance                                  | Isopropyl alcohol;<br>50 °C; method 2   | No visible damage                                 |                                  |
| 4.30                             | 45 (XA)                          | Solvent resistance of marking                                 | Isopropyl alcohol;<br>50 °C; method 1,<br>toothbrush  | Marking legible,<br>no visible damage             |                                  |
| 4.22                             | 6 (Fc)                           | Vibration, endurance by sweeping                              | f = 10 Hz to 2000 Hz;<br>x, y, z $\leq$ 1.5 mm;<br>A $\leq$ 200 m/s <sup>2</sup> ;<br>10 sweeps per axis    | $\pm$ (0.25 % R + 0.05 $\Omega$ )                 | $\pm$ (0.5 % R + 0.05 $\Omega$ ) |
| 4.37                             | -                                | Periodic electric overload                                    | $U = \sqrt{15 \times P_{70} \times R}$<br>$\leq 2 \times U_{max.}$ ;<br>0.1 s on; 2.5 s off;<br>1000 cycles | $\pm$ (1 % R + 0.05 $\Omega$ )                    |                                  |
| 4.27                             | -                                | Single pulse high voltage overload,<br>10 $\mu$ s/700 $\mu$ s | $\dot{U} = 10 \times \sqrt{P_{70} \times R}$<br>$\leq 2 \times U_{max.}$ ;<br>10 pulses                     | $\pm$ (1 % R + 0.05 $\Omega$ )                    |                                  |

All tests are carried out in accordance with the following specifications:

- EN 60115-1, generic specification
- EN 140400, sectional specification
- EN 140401-802, detail specification
- IEC 60068-2, environmental test procedures

Packaging of components is done in paper tapes according to IEC 60286-3.



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